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Wind Erosion Control on IRRIGATED LANDS

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WIND EROSION CONTROL ON IRRIGATED LANDS

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It is somewhat ironical that wind erosion is a serious problem on many irrigated fields; this is a problem generally associated with lack of moisture.

But irrigation alone cannot control wind erosion. It is impractical to irrigate often enough to prevent soil from blowing. When the soil surface dries to a depth of two soil particles, the top one can blow.

In many irrigated areas all the conditions conducive to severe wind erosion are present:

- Wind velocities in most irrigated areas are high enough to cause soil blowing.
- Row crops are grown on a high percentage of irrigated land; culture of such crops often leaves the soil pulverized and bare.
- Land leveling and other intensive soil working during the preparation of the land for irrigation may destroy all vegetative protection and pulverize the soil.

GENERAL PRINCIPLES

Live vegetation or vegetative residue on the soil provides the best protection against wind erosion. A rough, cloddy surface gives protection in the absence of vegetation. But the rough surface is only temporary; clods eventually break down. Wind erosion control recommendations, therefore, are based on two general principles:

1. Maintain a vegetative cover on the land as much of the time as possible.
2. Keep the soil surface rough and cloddy during the intervals that land is without vegetative protection.

Wind erosion control on irrigated lands can be roughly divided into two phases:

1. Control during the initial preparation and development of a new field for irrigation.
2. Control on an established field, where the soil has been stabilized, or "tied down," as a result of practices employed in the first phase.

NEW FIELDS

Limit Development

Before developing land for irrigation, you must decide how much new land you can properly handle.

[1] This publication is based in part on a field-scale demonstration of the practical development of an irrigation farm under severe wind erosion conditions in the Columbia Basin Project in the State of Washington. The 100-acre demonstration farm had 83 acres of irrigable land. By Bureau of Reclamation classification, 59 acres was Class 2 land (Othello fine sandy loam) and 24 acres was Class 3 land (Quincy and Burke loamy sands). Work was conducted by the Soil and Water Conservation Research Division of the Agricultural Research Service and the Soil Conservation Service, U.S. Department of Agriculture; the Washington Agricultural Experiment Station; and the Bureau of Reclamation, U.S. Department of the Interior.

The main danger is destroying the vegetative cover on an area being developed for irrigation, then being forced to abandon it for several months before new cover can be established. In general, it is safer to underestimate than to overestimate how much land you can develop.

Start in the Summer

The growing season is the best time for initial land preparation, such as leveling and ditching. Wind velocity is generally lower in the summer than in other seasons; there is less danger of soil blowing while the land is disturbed and without vegetative cover.

It is also possible, during the growing season, to establish a cover crop quickly and keep to a minimum the time that land will be without vegetative protection. If initial preparations are made any time between fall and early spring, the land may be extremely susceptible to blowing for several months.

Taking the first steps during the growing season is almost essential if the soil is a type that is exceptionally susceptible to erosion and if leveling destroys the vegetative cover. When such soil is leveled during the winter and several months of windy weather intervene before planting time, erosion may be so severe that all the leveling and ditching must be done over.

Stabilize the Soil

If wind erosion is a serious threat the main purpose of planting the first crop is to stabilize, or "tie down," the soil. A good schedule for initial work on an irrigated field is—

- June: Complete land preparation.
- July and August: Conduct "shakedown" tests of the irrigation system; find out if there are any weak spots in ditches or high and low spots in the field. Correct any defects that are discovered.
- August: Plant a winterhardy grain or other effective winter cover crop. (If it was not necessary to destroy the existing vegetation in preparing the land for irrigation, do not plow it under to prepare a seedbed for the cover crop. Sow the cover crop in the vegetative residue.)

Whether you should start regular cropping practices the following year or continue with a soil-stabilization program will depend on how susceptible the soil is to blowing. If the soil is exceptionally susceptible, it may be best to keep the field under a cover crop for the entire second season. Or planting a permanent pasture may be the best solution (fig. 1).

After the soil is stabilized, start a regular cropping system that includes erosion-prevention practices.

ESTABLISHED FIELDS

Delay Seedbed Preparation

If the cover crop, stubble, or other vegetative residue must be plowed under to prepare a seedbed for drilled crops or cultivated row crops, the interval between seedbed preparation and planting should be as short as possible. In general, do the plowing as late as you can, and still allow time to get the summer crop planted on the date it should be planted.

Sometimes, when warm weather occurs in the winter or early spring, there is a temptation to get the plowing done before the busy spring season starts. Such early plowing exposes the soil, and should never be done in areas where strong winter winds prevail or where the soil is subject to blowing. Even if a cloddy surface is established on a winter-plowed field, it is very likely

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Figure 1.—A cloddy surface and ridging were not enough to prevent wind erosion in the spring seeding of wheat in this sandy field. Permanent pasture or hay crops should be planted in fields that are exceptionally susceptible to erosion.

that the clod structure will be broken down and that erosion will take place before a crop can be planted in the spring.

Seed Forages in Stubble

Do not plow under vegetation or stubble to prepare a seedbed for planting a hay or pasture crop. Leave the vegetative covering on the surface to prevent erosion and to protect the seedlings. Volunteer growth from the previous crop usually is either smothered by the seeded crop or eliminated at the first cutting or clipping.

If it is desirable to kill vegetation before planting the forage crop, use a duckfoot or similar implement to subtill 2 to 4 inches below the surface. This kills the plants but leaves most of the plant residue on the surface. Subtilling may be used to kill the winter cover crop, weeds, or existing native vegetation if it is a type that will compete strongly with the seeded crop.

After subtilling, allow time for the vegetation to die before starting seeding operations; if the vegetation is not dead it may revive when irrigation water is applied.

Ridge-Plant Row Crops

Plant row crops such as corn, beans, sugarbeets, and soybeans on ridges that have rough, cloddy surfaces. Ridge planting has two advantages:

1. It makes soil less subject to blowing.
2. The rough surface shelters the seedlings.

This protection is only temporary because wind and rain break down the clods (fig. 2). But the protection comes at a critical time; usually there is little or no vegeta-

tive protection for a newly planted row crop.

You can adapt a conventional planter to do ridge planting by attaching shovels just ahead of the planters. There are no difficulties with subsequent tillage operations such as cultivating and hilling.

Ridge planting also provides furrows for irrigation should it be desirable to apply water to the germinating seed or to the young plants.

Leave Erosion-Resistant Strips

Large fields of cultivated row crops are particularly susceptible to wind erosion until the crop produces enough foliage to reduce wind velocity at the soil surface. When you prepare the seedbed in such fields, leave occasional disk-wide strips of the stubble or winter cover crop. After the row crop produces enough growth to reduce wind velocity at the soil surface, you can disk down the protective strips.

Because soils vary so widely in their susceptibility to blowing, it is not possible to give specific recommendations on how far apart the strips should be. On soils that are known to blow easily, strips should be about 100 feet apart.

Strips are most protective if they are at right angles to prevailing winds, but they give some protection even if they are not at right angles.

Prepare Cloddy Seedbed

Plowing, ridging, disking, or other tillage operations for seedbed preparation and planting should

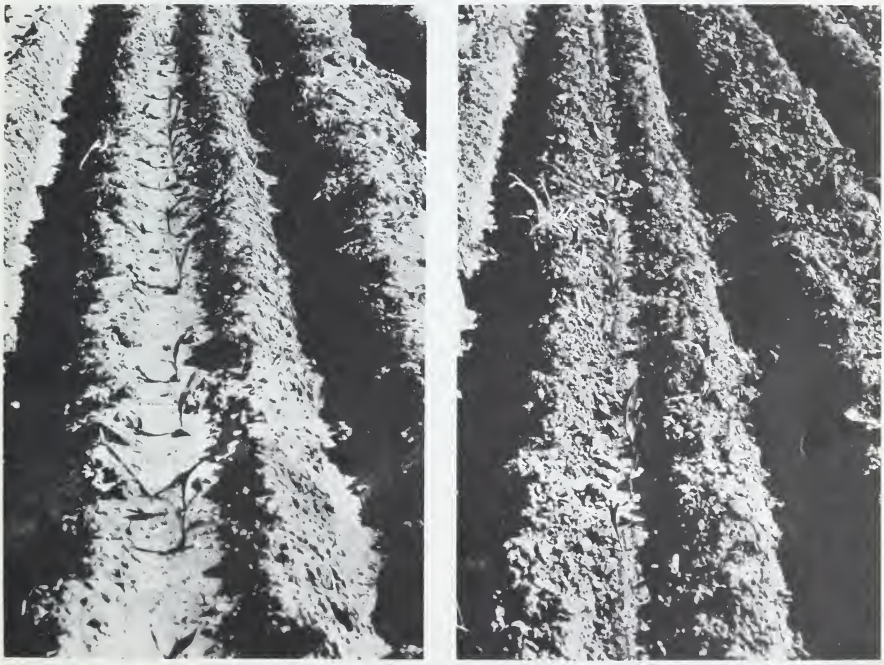

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Figure 2.—The rough, cloddy surface created by ridge-planting row crops will eventually break down: the clod structure in the soil shown at left was partly broken down by 0.63 inch of rain the day after the crop was planted; the part of the field planted after the rain (right) retains a cloddy surface. Normally, such surfaces resist erosion until the crop produces enough foliage to reduce wind velocity on the ground.

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Figure 3.—The nature of the surface left by a tillage tool depends on the moisture content of the soil. Here, ditcher shovels left a pulverized surface where they turned up dry soil, and a cloddy surface where they turned up moist soil.

leave the soil surface rough and cloddy. Such a surface gives temporary protection until the crop provides vegetative cover.

The critical factor in clod formation is soil moisture.

The soil is right for working when there is enough moisture for tillage implements to turn up clods, but not so much moisture that the soil will compact to the extent that there will be a permanent adverse effect on soil structure.

In some fields the surface soil may be too dry to form clods, but the soil beneath may be moist enough to form clods that will not immediately break down when brought to the surface (fig. 3). If the soil is so dry that even deep tillage will not bring clods to the surface, apply irrigation water before working the soil—do not till soil when the moisture level is so low that the surface is left pulverized.

Keep Surface Rough

The clod structure developed in correct seedbed preparation can be maintained by not doing tillage operations such as cultivating, ditching, hilling, or furrowing when the soil is dry. Figure 4 illustrates how a rough surface can be pulverized by cultivating dry soil.

Provide Winter Cover

Unless there is a thick stubble to protect the soil against wind erosion during the winter and early spring, plant a winter cover crop.

Plant a crop that you know is winterhardy in your area, and plant early enough to assure good establishment before the end of the growing season.

Winter wheat and winter rye are good cover crops in many areas.

Vetch combined with winter rye is very effective, and the vetch will add nitrogen to the soil. Oats and sweetclover are not recommended for colder climates; they may winterkill and leave little surface residue (fig. 5).

Your county agricultural agent or State agricultural experiment station can tell you which winter cover crops are best for your area.

Mulch Trouble Spots

Straw and similar crop residues added and disked into the surface provide excellent protection against wind erosion. They are particularly recommended for control of small problem areas.

They are not recommended for use on low-growing row crops because volunteer growth is highly objectionable. For example, a surface application of wheat straw to a bean field will give excellent protection against wind erosion. However, the crop may be a complete loss because the volunteer wheat in the rows not only retards the beans but also makes mechanical harvesting impossible. Corn would have outgrown the wheat.

When Necessary, Ridge

Ridging or furrowing normally is recommended for control of wind erosion only when it is not possible to maintain the preferred control—a vegetative covering.

Ridging is sometimes worth while following an early harvest of beans or beets; these crops leave

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Figure 4.—Tillage when the soil was moist produced a rough, cloddy surface in this sandy soil. Later, when the soil was dry, a tractor and implement were used in the field—and wherever the tires or wheels passed, the soil was left pulverized.

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Figure 5.—**Winter cover crops that are not winterhardy may completely fail as protection against wind erosion. In this field, the winter wheat in the background provides excellent protection; the oats in the foreground provides practically no protection even though the crop was about 10 inches tall when it winterkilled.**

little residue to prevent erosion until the winter cover crop can be planted.

Ridging might also be helpful if failure of the winter cover crop leaves the soil without vegetative protection.

Ridging for wind erosion is most effective if it is done when the soil has enough moisture to form clods. Ridges with broad crests are better for erosion control than ridges with sharp crests. Make ridges at right angles to prevailing winds.

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